

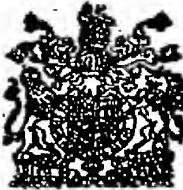
# PATENT SPECIFICATION

Convention Date (United States) : Feb. 5, 1916.

136,155

Application Date (in United Kingdom) : Dec. 1, 1919. No. 29,940 / 19.

Complete Accepted : Dec. 16, 1920.



## COMPLETE SPECIFICATION.

### Improvements in or relating to Submarine Boats.

We, ELECTRIC BOAT COMPANY, Manufacturers, having a place of business at Groton, County of New London, State of Connecticut, United States of America,  
5 Assignees of LAWRENCE YORK SPEAR, residing at Groton, County of New London, State of Connecticut, United States of America, do hereby declare the nature of this invention and in what  
10 manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to submarine boats and is directed to the provision of  
15 improvements whereby the element of danger incident to the operation of the boat is materially reduced.

Submarine boats have been suggested in which the hull is divided into a number of compartments by water-tight bulkheads containing hollow casings furnished with doors to provide an air-lock and to enable members of the crew to escape to other compartments or to the exterior of  
25 the boat, for example, with the aid of releasable hollow buoys normally secured in such casings and provided with doors and releasing means.

According to the present invention,  
30 provision is made in a submarine boat, divided interiorly into compartments including a plurality of refuge compartments, whereby the crew may localize and isolate a damaged or flooded compartment  
35 and manipulate from other compartments all the control devices for the ballast tanks, air compression and other apparatus whereby every effort may be made to raise the boat to the surface, and  
40 each of the said compartments which are capable of isolation are provided with a hatch for the escape of the crew to the exterior in the event of it being impossible to raise the boat. The boat is so constructed as to include a series of major

compartments and a series of minor compartments arranged in alternation with the major compartments, suitable doors being provided in each of these smaller compartments which whereby constitute 40 air-locks, and each air-lock is provided with individual controlling devices for governing the admission of air to, and the drainage of water from the lock in effecting escape from the lock to the 55 exterior of the vessel and in effecting passage from one of the major compartments of the vessel to another, and each of the compartments in which the crew would take refuge in event of an accident 60 to the vessel, is provided with controlling devices which may be manipulated in the effort to expel water from the ballast tanks and thereby raise the boat to the surface.

The features of the invention are illustrated in the accompanying drawings in which Fig. 1 is a diagrammatic, longitudinal, vertical section of a submarine boat, and Figs. 2, 3 and 4 are detail views of the bulkhead construction, Fig. 2 being a section on line 2—2 of Fig. 1, Fig. 3 a section on line 3—3 of Fig. 2, and Fig. 4 a section on line 4—4 of Fig. 3.

In Fig. 1, 5 indicates the hull of a 75 submarine boat, 6 the superstructure thereof, and 7 the usual conning tower. The interior of the hull is divided, by means of transverse bulkheads, into major and minor compartments, the minor compartments alternating with the major ones. The major compartments may consist of a forward compartment or torpedo room 8, a forward-midship or crew compartment 10, a central or operating compartment 11, an aft-midship compartment or engine room 12, and an aft-compartment or propeller shaft room 9. The minor compartments are interposed between these major compartments and constitute air- 80 85 90

locks as shown at 13 and 14 in Fig. 1. The air-locks 13 and the forward air-lock 14 are provided with fore and aft openings and doors for each of these openings; 5 the aft air-lock 14 has only one such opening and door. Figs. 2, 3 and 4 show the preferred construction of the air-locks and it will be noted therefrom that all of the doors open outwardly from the air-locks, 10 so that in the event of flooding of a major compartment, the water therein will tend to hold tightly closed the doors at the ends of that compartment.

The central compartment 11, the forward compartment 8, and the aft compartment 9 may be termed refuge compartments because if any one of the compartments of the boat be so damaged as to result in flooding, the members of the 20 crew therein can pass to one or another of the refuge compartments and each of these refuge compartments is provided with means whereby the members of the crew may effect escape to the exterior. 25 For this purpose, an air-lock communicating with each of these refuge compartments is provided with an escape hatch. Thus, the upper ends of the air-locks 14 are provided with hatches as is indicated at 14<sup>a</sup> in Fig. 1, and the central operating compartment 11 is provided with an escape hatch 7<sup>a</sup> in the conning tower 7. The major compartments from which these escape 30 hatches lead, are provided with hand-operated controlling devices for regulating the admission of air to, and the drainage of water from the air-locks when using them as escape passages.

40 The controlling mechanism of a submarine boat is usually installed in the central operating compartment and includes a pump, a motor driving the pump, a pump-manifold, air-flasks, an air-flask manifold and a marker buoy. In the present instance, these devices are duplicated in the forward and aft major compartments, which, with the central operating compartment, constitute the 45 refuge compartments. It will be noted that in the forward and aft compartments 50 8 and 9, there are shown in Fig. 1 a pump 15, a motor 16 driving the pump, a manifold 17 controlling the flow of water from the pump, air-flasks 19, an air-flask manifold 20, and a marker buoy 18. The several groups of air-flasks may be charged 55 through an air-supply pipe 21 from a compressor 22 in the engine room driven by the propelling engine 23. Each of the 60 several air-flask manifolds 20 may have a plurality of air pipes leading therefrom, each provided with a valve, these pipes

leading to the several ballast tanks, to the other groups of air-flasks and to other elements of the ship's equipment, as is usual in the controlling mechanism of submarine boats. One such connection from the manifold 20 leads to a conduit 65 24 running lengthwise of the boat and communicating with each of the several air-locks 13 and 14. As an additional safeguard, each pump manifold 17 may be arranged for connection to the pipe 24.

The rear end of the conduit 24 enters the aft air-lock 14 and is provided with a controlling cock 24<sup>b</sup> as shown in Fig. 1. The connection of the conduit 24 to each of the other air-locks is provided with a rotary valve 24<sup>c</sup>, as shown in Figs. 2 and 3, which may be opened and closed from either of the two major compartments adjoining that air-lock. This construction makes it possible for a member of the crew to pass from a flooded major compartment through an air-lock to a major compartment on the other side of the air-lock. Thus, a man in a flooded major compartment may manipulate the valve 24<sup>c</sup> in the adjacent air-lock to equalize the pressure on opposite sides of the door connecting that compartment to the air-lock to permit him to open the door and pass into the air-lock; then he may close the door, open the door at the other side of the air-lock and pass into the adjoining major compartment; he may then close the valve 24<sup>c</sup> by manipulating the handle in the compartment he has entered and thereafter he may again manipulate the valve from within the major compartment to utilize the air-lock as an escape hatch.

Each of the air-locks is provided with a drain pipe 25 which may be opened to 105 the sea through a suitable check valve as shown in Figs. 1, 2 and 3. Thus, by admitting air under pressure to the air-locks or any one of them, water therein may be expelled through the drain pipe 110 25.

It will be noted that the construction employed includes the provision of a plurality of refuge compartments in a submarine boat such that the crew of the 115 boat may take refuge in any one of these compartments in the event of injury to the hull of the boat making it dangerous or impossible to remain in other portions of the boat. Each of these several refuge 120 compartments is provided with all of the operating mechanism which it is necessary to manipulate in order to exhaust every effort to cause the boat to rise to the surface in the event of injury to the 125 hull causing the flooding or partial flood-

ing of other portions of the boat; thus, each of the refuge compartments is provided with a supply of compressed air and controlling devices operable from 5 within the compartment for admitting compressed air to the ballast tanks of the boat to expel the water therefrom and with a pump and operating mechanism whereby the pump may be connected to the ballast tanks and to the sea for pumping 10 the water out of the ballast tanks. Furthermore, each of the refuge compartments is provided with means for releasing a marker buoy or similar device attached to the exterior of the hull of the boat. Also, each of the several refuge compartments is provided with an escape hatch so that if the crew, on being driven into one of the refuge compartments, finds it impossible to cause the boat to rise, the escape hatch communicating with that refuge compartment may be utilized for the escape of the members of the crew one after another.

25 The bulkheads employed in dividing the interior of the boat into compartments as above described, must possess great strength because of the pressure to which they may be subjected in event of flooding of a compartment while the boat is submerged to a substantial depth. The preferred form of bulkhead consists of a curved or dished sheet metal plate extending transversely across the hull of the boat and peripherally-shaped to correspond to the interior section of the part of the hull 5 across which it extends, and a vertically disposed girder 27 of box section extending across the plate to stiffen and reinforce it. The periphery of the plate 26 and the ends of the girder 27 are secured to the hull 5. By this construction, ample strength may be secured with comparatively low weight 40 and at the same time the construction is well adapted to the formation of the air-lock above described in connection with each bulkhead.

Having now particularly described and 50 ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

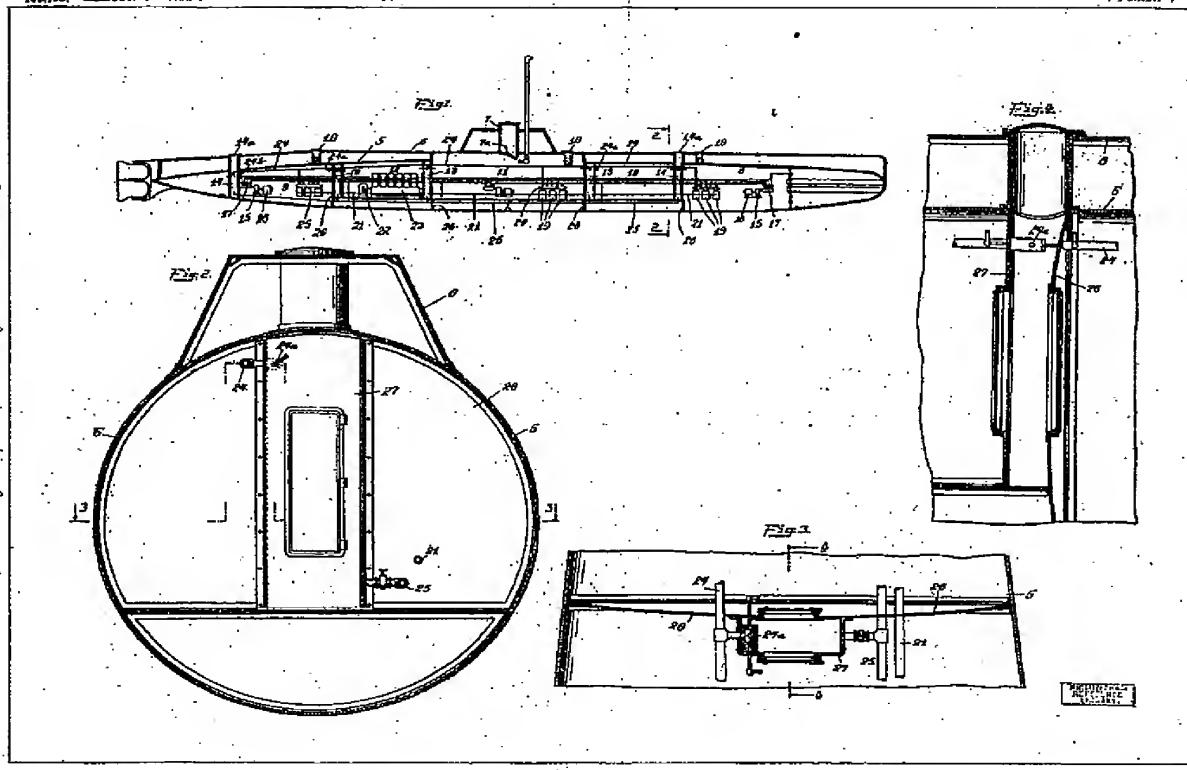
1. A submarine boat having a hull divided interiorly into compartments including a plurality of refuge compartments, the refuge compartments being individually equipped with means for controlling the various devices for raising the boat, whereby from any one of the compartments so equipped, attempts may be made to raise the vessel. 55
2. A submarine boat as claimed in Claim 1, wherein the refuge compartments are provided with a supply of compressed air and controlling means for causing said air to empty the ballast tanks of water, and with a pump which can be connected with the said ballast tanks and to the sea, substantially as and for the purpose set forth. 60
3. A submarine boat as claimed in Claim 1, wherein the refuge compartments are minor compartments separated from the major compartments of the boat by bulkheads and means controllable in the major compartments for governing the admission of air to and the drainage of water from the minor compartments, for the purposes set forth. 65
4. In a submarine boat according to Claim 3, wherein some or all of the refuge compartments are provided with escape hatches. 70
5. A submarine boat according to Claims 1, 2, or 3, wherein the interior is divided into compartments by sheet metal bulkheads extending across the interior of the hull, and wherein the girders of box section extend across the bulkheads and are secured to them, the interior of the said girders forming the minor compartments, substantially as described. 75
6. Submarine boats substantially as described and illustrated in the accompanying drawings. 80

Dated the 1st day of December, 1919.  
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 Agents for the Applicants. 100

*This Drawing is a reproduction of the Original on a reduced scale*

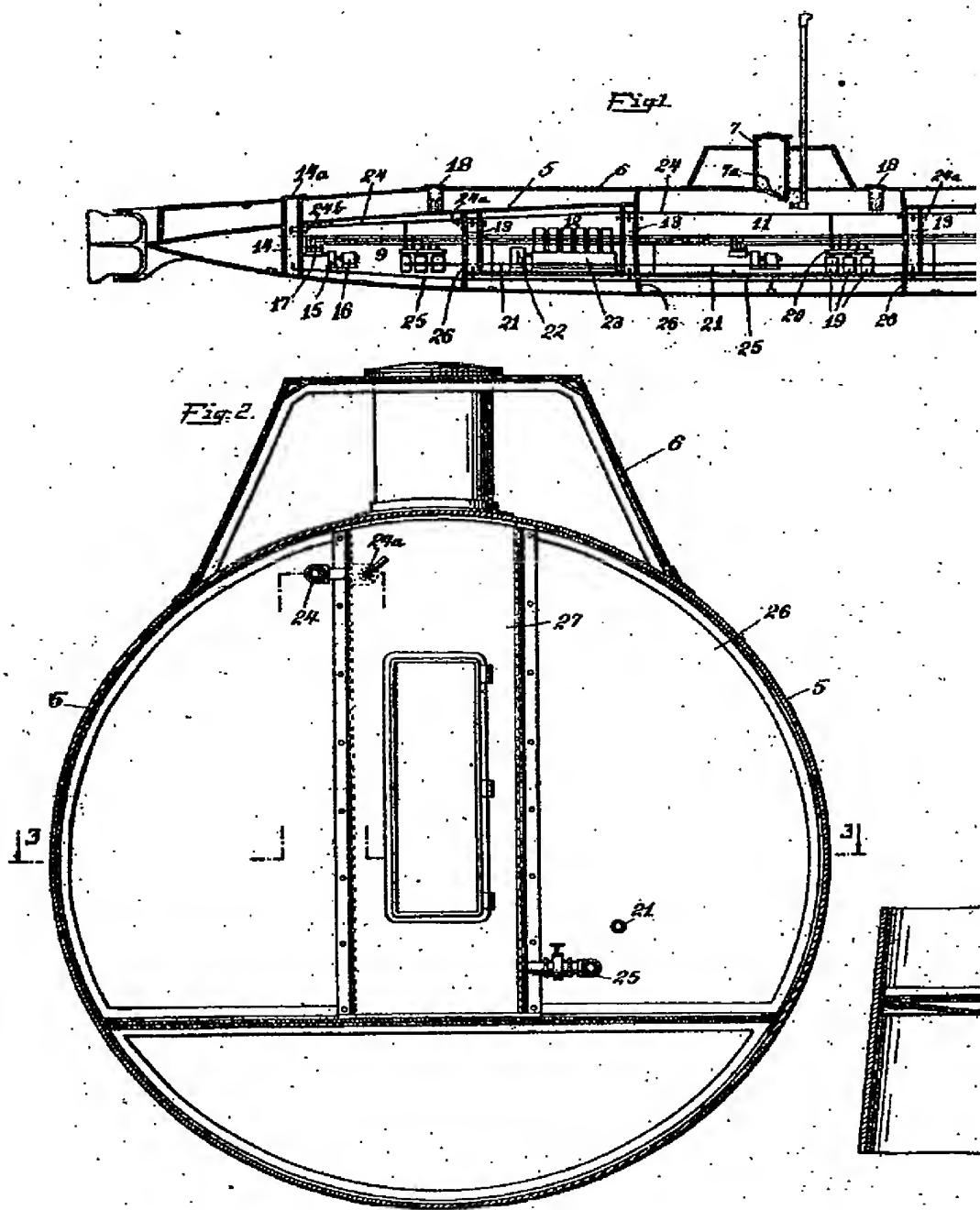
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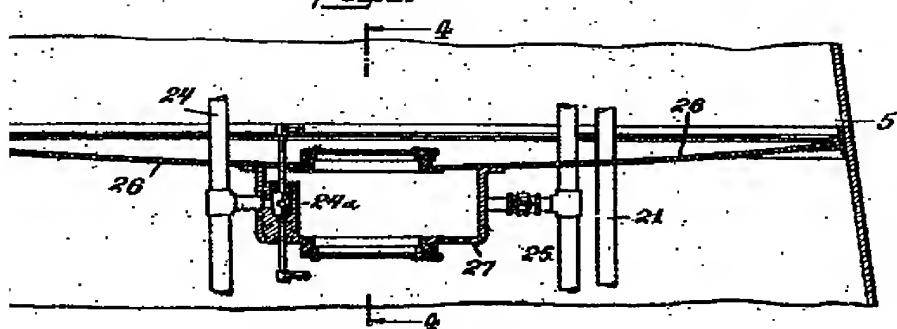
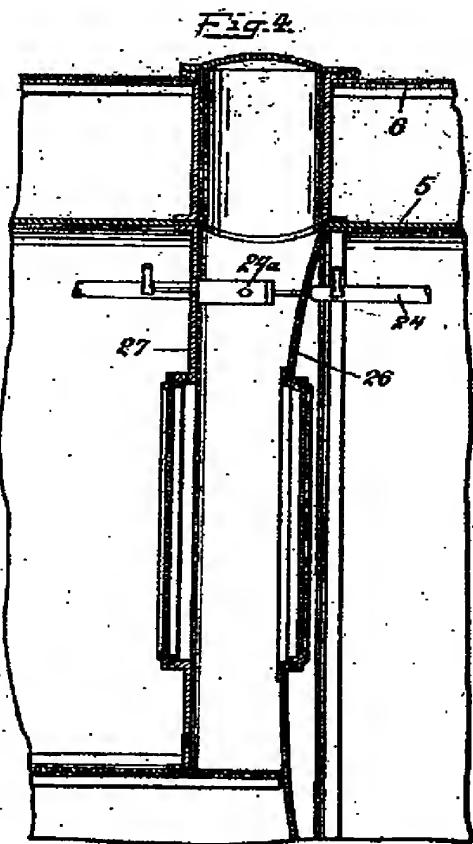
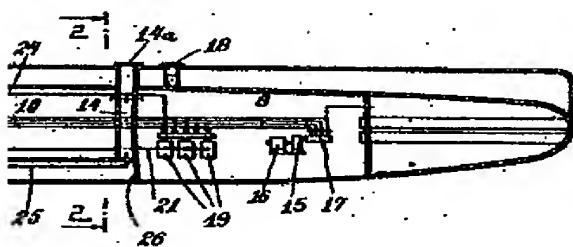
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